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Effect of Various Factors on Grades of New Zealand White Rabbitskins[1]

By Charles E. Kellogg and George S. Templeton, *Animal Husbandry Division, Bureau of Animal Industry, Agricultural Research Administration*[2]

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INTRODUCTION

Approximately 125 to 130 million rabbitskins are utilized annually in the United States, on the average. About 60 percent find their way into the hat trade; the remainder are used for fur garments, trimmings, and toys. Rabbitskins are used more extensively than any other kind by the fur trade because they are readily adaptable to imitation purposes. Fur dyers and dressers have mastered so well the art of imitating other furs by modern methods of plucking, shearing, and dyeing that the pelts of rabbits are being offered under a variety of trade names. It has been estimated that previous to the mouton popularity rabbit fur accounted for 50 percent of the entire fur business of the United States.

Most of the darker rabbitskin coats are made from wild gray rabbitskins shipped in principally from Australia and New Zealand. In

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[1] This work was begun in 1933 in the Bureau of Biological Survey of the U. S. Department of Agriculture. On July 1, 1939, this Bureau was transferred to the U. S. Department of the Interior, where it became part of the Fish and Wildlife Service. On June 30, 1946, by act of Congress, all activities of the Fish and Wildlife Service pertaining to the production of fur animals in captivity, including domestic rabbits, were transferred to the U. S. Department of Agriculture. The work reported in this circular was completed after this transfer.

[2] Mr. Kellogg is acting in charge of the fur farming investigations, Agricultural Research Center, Beltsville, Md., and Mr. Templeton is director of the U. S. Rabbit Experiment Station, Fontana, Calif.

1942, it was found from a special survey that 32 million gray rabbitskins, mostly from these two countries, were made into fur garments. These rabbits are trapped primarily during the winter season, when the furs of most of the animals are fully prime. The chief object in trapping is to eradicate them as pests—the value of the fur is secondary. Prime Australian rabbitskins average about 7 to the pound.

Before World War II, France furnished the United States about 30 million and Belgium 12 million raw rabbitskins annually. Import statistics did not segregate skins of wild rabbits from hutch-raised ones, but it is believed that a large proportion of the above number were from hutch-raised rabbits. About 1 million dressed rabbitskins, all from domestic rabbits, came into the United States annually, 50 percent of these being from France.

From information contributed by dealers in raw rabbitskins, by butchers in the Los Angeles area, and by rabbit-feed manufacturers, it has been estimated that 24 million domestic rabbits were raised in the United States during 1944—the peak year of rabbit production, due to war conditions. Rabbits are raised in this country primarily for their meat; skins are secondary. However, because of the exceedingly high price paid during 1944 for domestic rabbitskins, it is believed that most of them were marketed.

Rabbit raisers in southern California, the largest producing area in this country, have demonstrated that under their conditions selling the young when about 60 days old directly from the doe is the most profitable procedure. The skins from these California rabbits, for the most part, are properly dried to a uniform pattern and are known as fryer skins, an example of which is shown in figure 1, *B*. The New Zealand White rabbit is most commonly raised in California because of its meaty conformation and white color. Skins from white domestic rabbits command nearly twice the price of colored domestic skins because they can be dyed the lighter shades of desired colors. Skins from colored domestic rabbits are usually sold to the hat trade and are known as hatters. If used by furriers the skins must be dyed the darker shades, and for these dark colors the wild gray Australian rabbitskin is cheaper and more suitable because of its greater density and better quality.

Fur skins are handled in two ways: If the skin is cut down the belly before removal from the animal, it is known as open handled. If the unsplit skin is pulled off the animal like a glove off the hand, it is known as a cased skin.

Unprimeness, characterized by shedding and growing of new hairs, is clearly evident on the flesh side in colored skins by the extent and intensity of the pigment. In white skins, however, there is only faint discoloration on the flesh side in the unprime area perhaps due to tissue activity related to growth of the hair. This unprimeness can be detected in most cases by experts in grading the white skins. Prime rabbitskins of desirable quality are pliable, and the skin feels thick owing to the fullness of the fur separating the back and belly. Unprime skins feel irregular, flat, and harsh. If skins are prime, the fur, when rubbed the wrong way, returns immediately to its original position (fig. 2, *A*). If skins are not prime, the fur does not so readily return to its original smooth position (fig. 2, *B* and *C*). This unprime character-

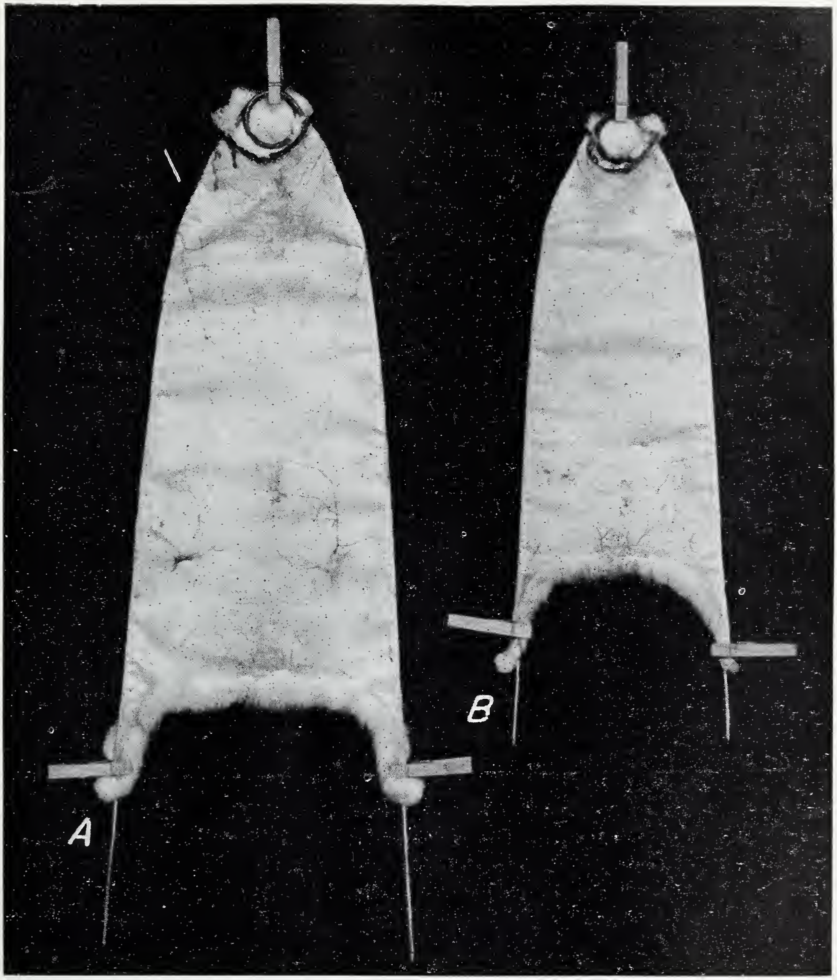

Figure 1.—Dorsal views of mature skin (*A*) and fryer skin (*B*), properly shaped and so placed on the stretcher that both front legs are on one side. Clothespins are used to insure a smooth skin by holding it tight and preventing curling at the edges.

istic, though observable in white rabbitskins, is shown photographically more clearly in colored skins.

More than 80 percent of the rabbitskins produced in this country are from young animals usually in various stages of shedding the baby coat of hair and developing a new coat. Rabbitskins are taken in all seasons of the year. In contrast, most other furs are taken from mature animals or those approaching maturity and during the months when priming, or full growth of fur, has occurred.

Since rabbitskins are relatively cheap, it is necessary in practical grading to sacrifice extreme accuracy to volume of business. Graders of finer furs, such as mink or Persian lamb, spend considerable time in grading the skins. After rabbitskins are cut open for dressing, they are again examined to cull out those suitable only for making hats. Before shearing or plucking, additional skins are discarded.

Skins from white domestic rabbits are frequently purchased without being graded (known as butcher run), but they may be classified into three or four quality grades according to size. Some firms re-sort into many grades according to the ultimate use of the skins. In general, the quality grades of raw skins are as follows:

Grade 1—Pluckers and shearers. Skins that are sufficiently dense, uniform, and free from shedding marks, that they may be either plucked or sheared to simulate more expensive furs that are ordinarily plucked and sheared. Rabbit fur of this quality returns promptly to its original position when the animal or the open-handled skin is rubbed against the direction of the fur (fig. 2, *A* and fig. 3).

Grade 2—Long hairs. Skins that are thinner in fur than those in grade 1 and have small shedding marks. The guard hairs are not plucked or sheared in this grade of skin. The defects are covered up to a large extent by the long guard hairs, or the defective parts are cut out and the skin is sewed up again. The poorer quality "long hairs" may be used for making toys or novelties.

Grade 3—Hatters. Skins unsuitable for furrier use because of very thin fur and molting marks. The fur of these skins can be cut and used in making hats.

When furs for garments are in keen demand all skins are usually graded up. Those that normally would be graded as hatters are sold as natural long hairs, and natural long hairs are sheared, and therefore graded as No. 1. Such a practice does not improve the reputation of rabbitskin coats. Gradings are also influenced by style demands for certain kinds of fur coats. For example, during some seasons natural long-hair rabbit coats are not in demand.

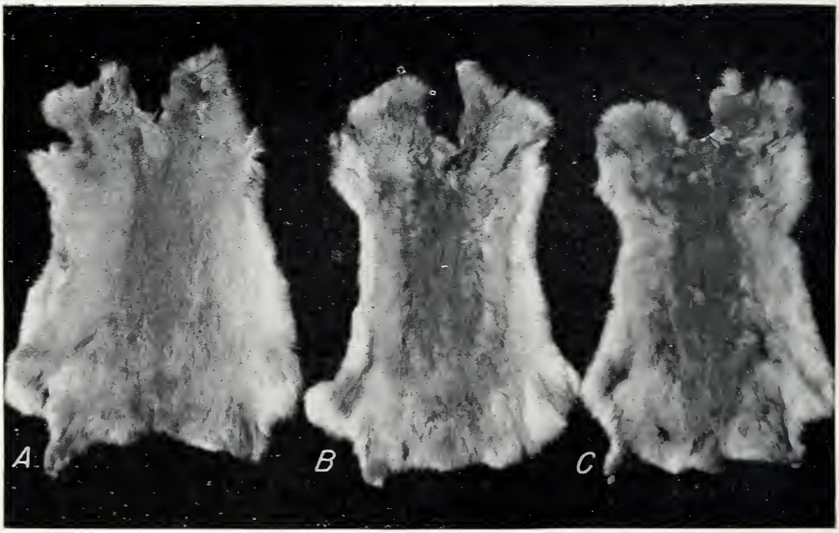

FIGURE 2.—Skins dressed "long hair" from New Zealand Red rabbits. All skins have been rubbed against the fur. *A*, Fully prime skin; *B*, prime skin on the back only; *C*, skin with all areas unprime. Note the rough appearance of sides of *B* and *C*, indicative of unprimeness due to shedding or molting.

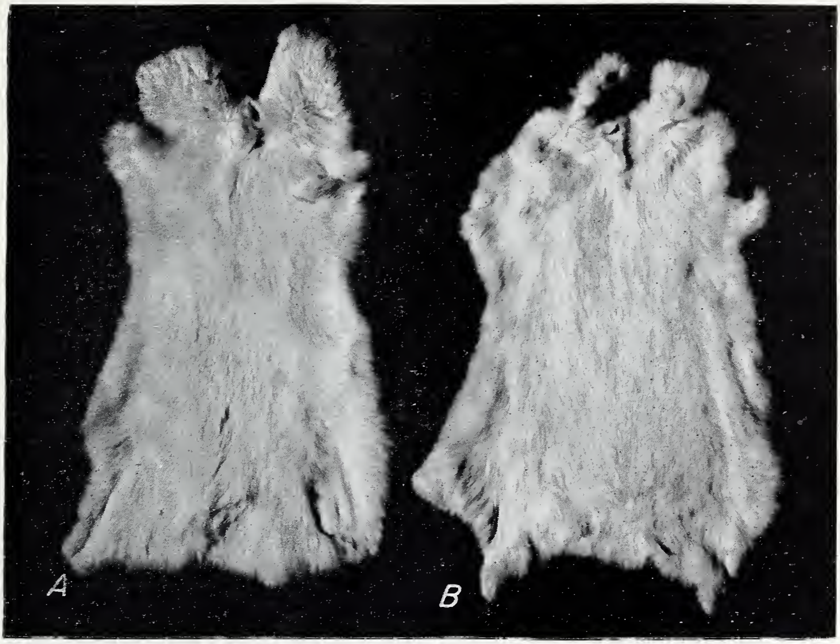

Figure 3.—Skins dressed "long hair" from New Zealand White rabbits. Both skins have been rubbed against the direction of the fur, which has returned immediately to normal position. These are fully prime skins, *A* being of exceptional quality and density.

The purpose of the study reported in this circular was to obtain information on the effect on grades of domestic rabbitskins, of various factors, including age and sex of the rabbits, methods of feeding, climate, and season of the year when the skins were taken.

MATERIALS AND METHODS

As already indicated, rabbitskins are a byproduct of the domestic-rabbit industry since rabbits are fed primarily to produce meat. Consequently, in order that the results obtained from the present study might be applicable to the rabbit industry, the skins of rabbits that had been used in meat-production studies were used. These skins numbered more than 1,000 and were taken from New Zealand White rabbits produced at the U. S. Rabbit Experiment Station, Fontana, Calif. (fig. 4). A few of the skins were produced in cooperation with the University of Minnesota. They were taken from rabbits from 56 days to more than a year old, or past maturity. The animals were killed at the station at the close of the nutrition experiments, and the skins were removed and were carefully prepared by taking off excess fat and by stretching and drying carefully, as illustrated in figure 1. An identification number was perforated into each skin for positive identification after shearing and dyeing.

In commercial practice only the better skins are sheared and dyed, but even then there are a few skins that are not suitable for garment purposes and are consequently discarded. These are known as rejects. Throughout this study practically all skins regardless of quality were processed as such treatment discloses any defects in the skins. As a result of this practice, the percentage of rejects is many times as high as in commercial practice. Before shearing and dyeing, all skins were graded individually and at different times by three to five leading dealers in raw rabbitskins and after shearing and dyeing by dealers in dressed rabbitskins or manufacturers. The final grades of both the raw and the processed skins were the average of the several recorded grades.

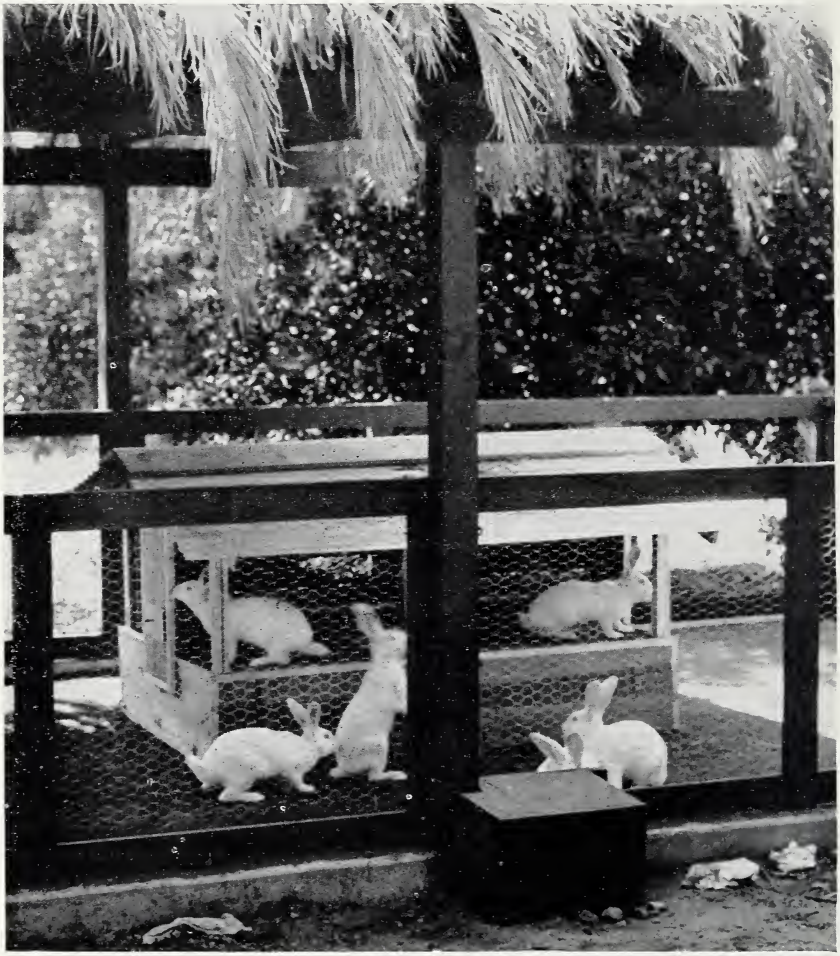

FIGURE 4.—New Zealand White rabbits produced at the United States Rabbit Experiment Station, Fontana, Calif., similar to those used in the present experiments.

In these studies, some of the dealers classified the raw skins into three grades comparable with those given on page 4. Others divided the raw skins into four grades, usually by subdividing grade 2 into grades 2 and 3. A similar procedure was followed by the graders of the sheared and dyed skins.

Since these experiments were not conducted for the specific purpose of obtaining data on skins, some of the data are not strictly comparable and some are too small in amount to yield conclusive results. General trends rather than exact effects of the various factors on grades of skins are shown. As far as the authors are aware, there is no published information of this nature on domestic rabbitskins.

SKINS FROM 56- TO 76-DAY-OLD RABBITS

Rabbits Restricted in Grain Feeding

Sixty rabbitskins, 28 from bucks and 32 from does, were taken at the United States Rabbit Experiment Station from April to June 1933, inclusive, from animals 56 to 76 days of age. These animals had been used in experiments in which the alfalfa hay consumption was arbitrarily set at 60 percent of the ration. Their average live weight when the skins were taken was 3.25 pounds.

The raw fryer skins were classified as small and were graded as follows: 33 percent as No. 1, 45 percent as No. 2, and 22 percent as No. 3, or hatters. After the skins were sheared and dyed, they were graded as follows: 88 percent as No. 1, 9 percent as No. 2, and 3 percent as No. 3, or rejects. Most of them were entirely free from shedding marks, as the rabbits had not yet developed to the stage at which shedding of the fur had begun. Their growth was slow because of restricted grain in the ration. A representative fryer rabbitskin is shown in figure 6, *B*.

A cheap fur, such as rabbit fur, is processed on a piece basis. Four representative sheared and dyed skins were trimmed and the parts that could be used in making a fur coat were measured. They averaged 61 square inches in size. Four sheared and dyed grade 1 and grade 2 skins from 6-pound rabbits trimmed in a similar manner provided 92 square inches of usable fur, or 49 percent greater area than from the small fryer rabbitskins. Three of the eight trimmed skins are shown in figure 5. The wearing quality of the fur, as well as of the leather, of the small fryer skins was judged to be much inferior to that of first-quality rabbitskins even though the former were graded as No. 1.

Self-Fed Rabbits

EFFECT OF LIVE WEIGHT, SEX, AND SEASON ON GRADE OF SKINS

One hundred forty-eight skins (73 from bucks and 75 from does) were taken from the station herd during February and March and from May through October inclusive, during the period from 1939 to 1945. Most of the animals had been self-fed grain and protein supplement and at 56 to 61 days of age, when the skins were taken, weighed on the average 3.9 pounds with a range of 2.6 to 5.0 pounds.

The butcher run of the skins of these fryer rabbits was graded as follows: 7.4 percent as No. 1; 29.0 percent as No. 2; 35.9 percent as No. 3; and 27.7 percent as No. 4, or hatters. There was no consistent relationship between live weight and quality of pelt produced, as shown

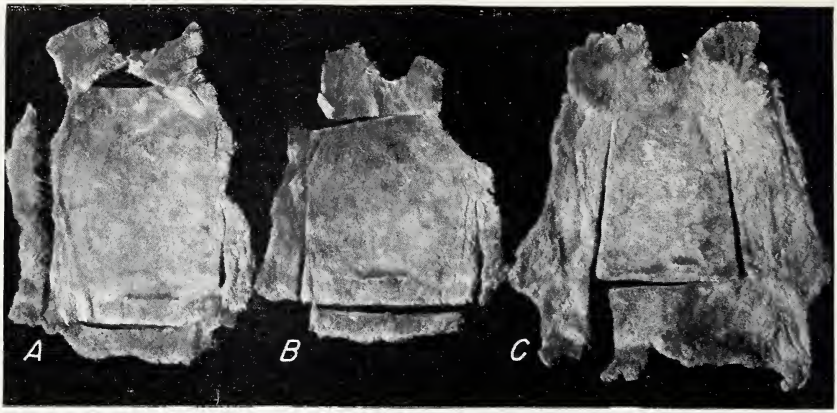

Figure 5.—Sheared and dyed white rabbitskins trimmed by a furrier to obtain parts usable for fur garment. *A*, 108 square inches of usable fur from a 115-day-old doe and graded as No. 1 both in the raw and after dressing; *B*, 74 square inches of usable fur from a 57-day-old doe and graded as No. 1 in both the raw and dressed condition; *C*, 58 square inches of usable fur from a 101-day-old buck and graded as No. 1 in the raw and as a reject after dressing.

by table 1. This table also shows that the skins from the does graded materially lower than those from the bucks.

Table 1.—*Relation of grade of raw fryer skins to live weight and sex of rabbits*

Grade of raw skins [1]	Bucks				Does			
	Skins in each grade		Live weight of rabbits		Skins in each grade		Live weight of rabbits	
			Range	Average			Range	Average
	Number	*Percent*	*Pounds*	*Pounds*	*Number*	*Percent*	*Pounds*	*Pounds*
1	7	9.6	2.7–4.5	4.01	4	5.3	3.7–4.1	3.88
2	25	34.3	2.6–4.3	3.87	18	24.0	3.4–4.5	3.94
3	22	30.1	3.6–4.8	4.08	31	41.4	3.2–4.4	3.81
4	19	26.0	3.1–5.0	3.89	22	29.3	3.4–5.0	3.97
Total or average	73	100.0	3.0–4.6	3.95	75	100.0	3.4–4.6	3.89

[1] Weighted average grade of buck skins is 2.7; of doe skins, 2.9; and of the entire group, 2.8. Weighted averages were obtained by multiplying the number of skins in grade 1 by 1, number of skins in grade 2 by 2, etc., and dividing the sum by the total number of skins.

Skins were taken during 8 months of the year. Only June, July, and August produced No. 1 skins, with percentages of 21.0, 5.6, and 2.8, respectively. Furthermore, these same 3 months produced the highest percentages of No. 2 skins of any of the 8 months. Therefore, the season of the year in which the fryer skins were produced apparently had little effect on the grades. These results are at variance with those normally obtained with mature wild animals as they tend to produce the heaviest and, therefore, the best grades of fur during the coldest months of the year.

EFFECT OF CLIMATE ON GRADE

For use in the nutrition experiments, some 6- to 7-month-old does were shipped from Fontana, Calif., to the Minnesota Department of Agriculture. These animals were fed various cereals grown in that area and pelleted linseed meal in separate compartments of self-feeders during lactation. Alfalfa was available at all times. The animals were housed in an unheated, well-ventilated building.

Of the young produced the first winter, 52 were slaughtered from November 5, 1943, to January 17, 1944, at 56 to 70 days of age. Their skins were graded by the same dealers in raw rabbitskins who had graded the skins from the United States Rabbit Experiment Station. The percentage distribution in the various grades was as follows: No. 1, 19.2; No. 2, 26.9; No. 3, 30.8; No. 4, or hatters, 23.1. During February, March, and April 1944, 44 additional skins were taken from fryer rabbits. These were graded as follows: No. 1, 11.4 percent; No. 2, 22.7 percent; No. 3, 15.9 percent; and No. 4, or hatters, 50.0 percent. When the grades for the 96 skins were combined, the percentage distribution was as follows: No. 1, 15.6; No. 2, 25.0; No. 3, 24.0; and No. 4, or hatters, 35.4. These Minnesota-produced skins had a somewhat higher percentage grading No. 1 than the California-produced skins, most of which were taken from July to August. However, the latter skins had a somewhat higher percentage grading No. 2. The Minnesota skins averaged almost twice as many hatters as those from California. From these data, climatic conditions appear to affect but little the quality of fryer rabbitskins.

YIELD OF FUR SUITABLE FOR HAT MAKING

The price paid for domestic rabbitskins suitable for fur purposes is usually greater than the price paid by the hat trade. The popularity of rabbitskin coats, however, is dependent upon fashion, and fashion may decree that rabbit coats are not wanted. It was deemed advisable, therefore, to obtain information on the yields of hatters' fur from the better grades of domestic rabbitskins should it become necessary to divert them to the hat trade.

In this study, 100 skins taken in June, July, and August were divided, according to grade and sex, and were sent to a large manufacturer of felt hats to obtain data on the use of this type of skin for this purpose.

In general, the following processes are involved in obtaining the fur used in making felt hats. The tips of the guard hairs are clipped by special machines; the fur is then carroted, that is, a solution is applied to give the fur its felting qualities; and the skin is laid aside for several weeks to "ripen." It is cut into shreds away from the fur, and then the remaining clipped guard hairs are separated from the underfur by blowing. This resulting underfur is used in the felt-hat trade and is known as hatters' cut fur. The standard large blowing machines used at the factory do their best work when fairly large quantities of fur can be handled at one time. In order, therefore, to make as large quantities as possible and yet obtain the desired information, the doe skins in this study grading No. 1 were combined with those grading No. 2, and those grading No. 3 were combined with those grading No. 4. The buck skins were handled in a similar manner.

The pertinent findings from this study are given in table 2. Since most raw rabbitskins are bought by the pound, the yield of blown fur per pound of raw skins, as well as per 100 skins, is shown. On the basis of weight of skin, grades 1 and 2 of the doe skins yielded over 16 percent more blown fur than grades 3 and 4. Grades 1 and 2 of the buck skins yielded 24 percent more blown fur than the lower grades. Grades 1 and 2 butcher-run fryer rabbitskins from does and bucks combined will therefore yield about 20 percent more blown fur than grades 3 and 4. The raw doe skins of grades 1 and 2 yielded over 9 percent more blown fur than the same weight of buck skins of the same grades. Grades 3 and 4 of the doe skins yielded over 16 percent more blown fur than the same grades of the buck skins. The does, therefore, produced more fur of all grades in spite of the fact that the buck skins graded higher, on the average, than did the doe skins.

Buck skins are heavier in the "leather" and consequently weigh slightly more per skin than those of does. In this study, doe skins, whether grading 1 and 2 or 3 and 4, yielded 5 percent more blown fur than the same number of buck skins weighing considerably more. When the animals of both sexes were combined, grades 1 and 2 of the fryer rabbitskins yielded about 27 percent more blown fur than the same number of skins of the lower grades.

Because the blowing machines handle to better advantage larger quantities of fur than those used in this study, as indicated previously, the quantities of blown fur that can be obtained from the different grades undoubtedly would be somewhat larger than those indicated in table 2. However, the data given show the relationship of the several grades in yield of such fur.

TABLE 2.—*Relation of grade of skins and sex of rabbits to yield of fur suitable for making hats*

Grade of raw skins	Sex of rabbits	Total skins	Skins per pound [1]	Yield of blown fur—	
				Per pound raw skins [1]	Per 100 skins
		Number	*Number*	*Ounces*	*Ounces*
1 and 2	Doe	19	6. 6	3. 22	48. 63
1 and 2	Buck	27	6. 3	2. 94	46. 30
3 and 4	Doe	32	7. 2	2. 76	38. 28
3 and 4	Buck	22	6. 5	2. 37	36. 36
Total or average		100	6. 7	2. 81	42. 00

[1] Weights at factory 5 months after slaughtering.

SKINS FROM 85-DAY-OLD RABBITS

Skins from 72 rabbits, 36 from bucks and 36 from does, were taken at the United States Rabbit Experiment Station the last of January 1936. These rabbits, when weaned at 56 days of age, averaged 3.4 pounds in weight. They were kept until 85 days of age, at which time they averaged 5.5 pounds with a range in weight of 4.5 to 6.8 pounds.

The self-feeding system for rabbits had not yet been devised, and alfalfa hay comprised 54.5 percent of the total feed consumed since weaning. The pelts averaged 0.22 pound in weight 14 days after the animals were killed.

Skins from bucks of this age and with this type of feeding tended to grade higher than skins from does (table 3). About two-thirds of the skins graded 3 and 4. Though a higher percentage of the skins from rabbits weighing less than 5 pounds were graded 1 and 2, there were also more No. 4 skins from this group than from the rabbits weighing more than 5 pounds. It is not known whether these differences in skins are due to shedding marks or to inherited difference in quality of fur. It seems plausible that, in some of these rabbits weighing less than 5 pounds, shedding preliminary to growth of the second coat had been delayed, thereby causing a higher percentage of the skins to grade as furriers.

Table 3.—*Effect of sex and weight of 85-day-old rabbits on grade of raw skins*

Sex or weight of rabbits [1]	Total rabbits	Distribution of skins				Weighted average grade [2]
		Grade 1	Grade 2	Grade 3	Grade 4	
	Number	*Percent*	*Percent*	*Percent*	*Percent*	
Bucks	36	8. 3	36. 1	52. 8	2. 8	2. 5
Does	36	5. 6	16. 6	66. 6	11. 1	2. 8
Sexes combined	72	6. 9	26. 4	59. 7	6. 9	2. 7
Less than 5 pounds	9	11. 1	44. 5	33. 3	11. 1	2. 4
5 to 6 pounds	52	6. 8	23. 1	63. 4	7. 7	2. 7
More than 6 pounds	11	9. 1	27. 3	63. 6	0	2. 5
Weights combined	72	6. 9	26. 4	59. 7	6. 9	2. 7

[1] The same rabbits were used in the weight groupings as in the sex groupings.
[2] Obtained as stated in footnote 1 of table 1.

SKINS FROM 6-POUND RABBITS

Skins from 417 rabbits (199 from bucks and 218 from does) were taken at the United States Rabbit Experiment Station in 1932–35. These animals were fed various types of rations, but the hay consumption was regulated to 60 percent of the entire ration. Entire litters were used in these studies to avoid a bias due to retention of only the best animals for breeding purposes. Litters containing fewer than 3 animals were excluded. Animals were weighed individually at weekly intervals and were slaughtered as soon as they were found to weigh 6 pounds. At this time they varied in age from 73 to 184 days. Skins were taken every month of the year.

Grades of Raw and of Sheared and Dyed Skins

The skins after curing weighed an average of one-fourth pound. In this study 391 of the 417 skins were sheared and dyed. Only 19 of the 62 skins grading as No. 1 in the raw were still No. 1 after processing (table 4). One of these skins is shown in figure 6, *A*. Five skins grading as No. 3 in the raw were judged to be No. 1 after shearing and dyeing. The same number of skins (5) grading as No. 1 in the raw were considered to be rejects after dyeing. There were 79 skins grading No. 3 (hatter stock) in the raw that were also rejects after dyeing. Two of these are shown in figure 6, *D* and *E*. Of the 391 skins, only 4.8 percent were considered, both in the raw and after dyeing, to be first-class skins and 20.2 percent were suitable only for felt making. The variability of grades of the other skins may also be noted in table 4. Undoubtedly most of the apparent confusion occurred with the skins on the border line between grades because the judges selected were considered to be among the best in the trade.

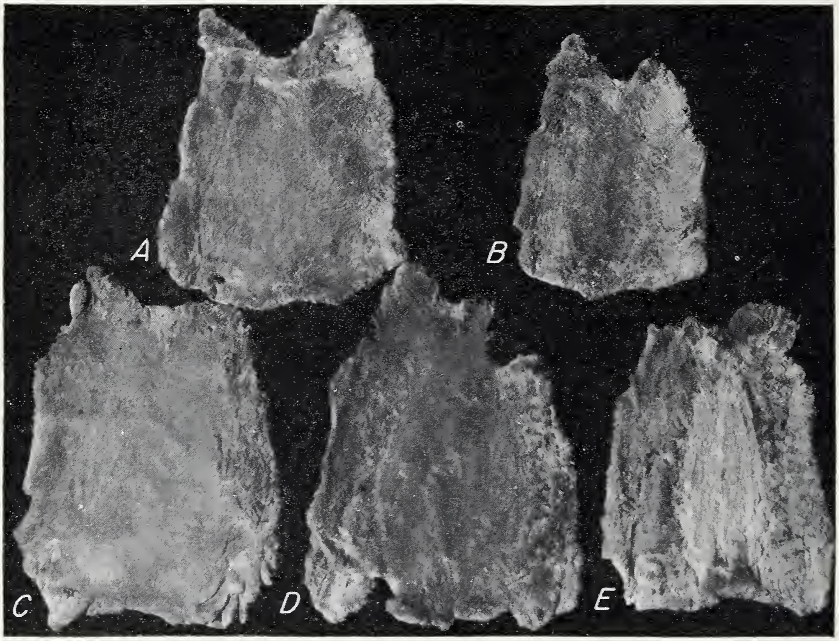

FIGURE 6.—Sheared and dyed white rabbitskins: *A*, From a 138-day-old 6-pound rabbit and graded medium size No. 1 both in the raw and after dressing; *B*, from a 65-day-old fryer doe and graded small No. 1 both in the raw and after dressing; *C*, from a 116-day-old 6-pound doe and graded No. 2 in both conditions; *D*, from a 94-day-old 6-pound doe and graded No. 3, or hatters, in the raw and No. 3 after dressing; *E*, from a 101-day-old 6-pound buck and graded No. 3, or hatters, in the raw and reject after dressing. (Note, by comparison with figure 5, the percentage of fur that would be usable for garments.)

The weighted average grades of these 391 skins were 2.2 for the raw skins on the basis of only three grades and 2.8 for the sheared and dyed skins on the basis of four grades. Caution should be exercised in comparing average grades when three and four grades are involved, since the latter naturally would have a higher numerical grading because of the extra grade being considered.

The rabbit raiser is more interested in the classification of the raw skins than of the cured skins since the former are the ones that he sells.

TABLE 4.—*Distribution of skins from 6-pound rabbits by grades in the raw and after shearing and dyeing*

Grade of raw skins	Sheared and dyed skins in—									
	Grade 1		Grade 2		Grade 3		Rejects		Total	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
1	19	4. 8	27	6. 9	11	2. 8	5	1. 3	62	15. 8
2	28	7. 2	66	16. 9	52	13. 3	48	12. 3	194	49. 7
3	5	1. 3	24	6. 1	27	6. 9	79	20. 2	135	34. 5
Total	52	13. 3	117	29. 9	90	23. 0	132	33. 8	391	100. 0

Table 5 shows that, in this study, the raw skins from white 6-pound rabbits raised in California, fed rations containing 60 percent alfalfa hay, graded as follows: About 16 percent as No. 1, 48 percent as No. 2, and 35 percent as No. 3. Market conditions will affect the percentage relationship.

EFFECT OF AGE ON GRADE OF SKINS

As already stated, the 6-pound rabbits varied in age from 73 to 184 days, their average age being 109 days. About three-fourths of them, however, were from 95 to 125 days old. The number of raw and of sheared and dyed skins within each 5-day interval and their percentage distribution in each grade are given in table 6. These data show that rabbits more than 135 days old tended to produce the highest percentage of the better grade of skins. Some grade 1 skins, however, were produced at any age.

Approximately 50 percent of all raw skins from rabbits 85 to 105 days of age were graded as hatters (grade 3). The primary fault with these skins was the presence of "shedding" spots varying in size and degree. The older, slower-developing rabbits tended to produce a higher percentage of the better raw pelts. Of the 19 skins grading No. 1 in the raw as well as after dyeing (table 4), all but 1 were from rabbits more than 100 days old. The 28 skins considered as grade 2 in the raw and placed in grade 1 after being dyed were about equal in all age groups.

TABLE 5.—*Relation between sex of 6-pound rabbits of varying ages and grade of raw skins*

Grade of raw skins	Buck skins		Doe skins		Total skins		Average age of rabbits
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Days*
1	33	16. 6	35	16. 0	68	16. 3	116. 7
2	90	45. 2	112	51. 4	202	48. 4	110. 4
3	76	38. 2	71	32. 6	147	35. 3	102. 5
Total	199	100. 0	218	100. 0	417	100. 0	108. 6

TABLE 6.—*Relation between age of 6-pound rabbits and grade of raw skins and sheared and dyed skins*

Age of rabbits in days	Raw skins				Sheared and dyed skins				
	Total skins	Grade 1	Grade 2	Grade 3	Total skins	Grade 1	Grade 2 [1]	Grade 3 [1]	Rejects
	Number	*Percent*	*Percent*	*Percent*	*Number*	*Percent*	*Percent*	*Percent*	*Percent*
70–74	1	0	100.0	0	1	0	100.0	0	0
75–79	2	0	0	100.0	2	100.0	0	0	0
80–84	10	10.0	70.0	20.0	8	37.5	62.5	0	0
85–89	18	11.1	38.9	50.0	16	18.8	31.2	25.0	25.0
90–94	34	2.9	50.0	47.1	32	9.4	31.2	18.8	40.6
95–99	42	9.5	40.5	50.0	41	9.8	26.8	24.4	39.0
100–104	78	9.0	41.0	50.0	71	8.4	23.9	23.9	43.8
105–109	66	16.7	43.9	39.4	63	7.9	33.3	30.2	28.6
110–114	31	16.1	45.2	38.7	31	12.9	29.0	19.4	38.7
115–119	52	21.2	59.6	19.2	46	19.6	26.1	30.4	23.9
120–124	32	31.2	62.5	6.3	30	6.7	40.0	23.3	30.0
125–129	19	21.0	52.6	26.4	18	11.1	38.9	5.6	44.4
130–134	8	12.5	62.5	25.0	8	25.0	37.5	0	37.5
135–139	11	36.4	54.5	9.1	11	36.4	18.2	9.1	36.4
140–144	5	60.0	40.0	0	5	20.0	20.0	20.0	40.0
145–149	4	75.0	25.0	0	4	50.0	25.0	25.0	0
150–154	1	0	100.0	0	1	0	0	0	100.0
155–159	2	0	100.0	0	2	0	50.0	0	50.0
180–184	1	100.0	0	0	1	0	0	100.0	0
Total	417	16.3	48.4	35.3	391	13.3	29.9	23.0	33.8

---

[1] Grades 2 and 3 of the sheared and dyed skins are subdivisions, for the most part, of grade 2 of the raw skins.

SEASONAL INFLUENCE

The grades of the 417 rabbitskins were tabulated by months when the skins were taken (table 7). The average age of these rabbits was approximately 3½ months. Some grade 1 skins were produced in every month of the year except September and October. These 2 months produced the maximum hatter stock; about 75 percent of the skins taken during September and October were graded as hatters. Nearly 40 percent of the raw skins taken during December graded as No. 1 and less than 2 percent as No. 3. That the seasonal condition is not the sole cause or perhaps even the primary cause of this large percentage of No. 1 skins in rabbits of this age is evidenced by the fact that January, a month of low average temperatures, produced less than 11 percent of No. 1 skins. The December skins were taken from somewhat older animals. There was a direct relation between the percentage of No. 3 raw skins produced and the temperature readings. The data on grades of dressed skins conform in general with those on raw skins.

A further study of the seasonal effect on grade of the skins was made with the 3 groups of rabbits 101, 108, and 115 days old, each group comprising approximately 30 skins (table 8). Again it is shown that quality of skins from young rabbits is not related to the season in which the skins are taken. These tables also reveal that better quality skins are produced by older animals. Apparently the seasonal difference in den-

TABLE 7.—*Effect of month in which skins were taken on grade of skins from 6-pound rabbits*

Month of taking skins	Total skins		Distribution of skins						Average age of rabbits
	Raw	Sheared and dyed	Raw, grade 1	Sheared and dyed, grade 1	Raw, grade 2	Sheared and dyed, grades 2 and 3 [1]	Raw, grade 3	Sheared and dyed, rejects	
	Number	*Number*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Days*
January	28	25	10. 7	4. 0	71. 4	12. 0 32. 0	17. 8	52. 0	100. 6
February	16	15	25. 0	0	50. 0	33. 3 20. 0	25. 0	46. 7	114. 2
March	20	18	15. 0	55. 5	65. 0	27. 8 5. 6	20. 0	11. 1	92. 5
April	14	12	14. 3	0	71. 4	58. 3 25. 0	14. 3	16. 7	103. 9
May	53	50	11. 3	12. 0	62. 3	18. 0 20. 0	26. 4	50. 0	115. 8
June	34	32	26. 5	21. 9	35. 3	28. 1 31. 2	38. 2	18. 8	117. 0
July	68	67	11. 8	17. 9	41. 2	37. 3 19. 4	47. 0	25. 4	107. 9
August	42	42	16. 7	21. 4	33. 3	26. 2 26. 2	50. 0	26. 2	105. 0
September	23	23	0	0	26. 1	17. 4 17. 4	73. 9	65. 2	103. 8
October	13	13	0	0	23. 1	0 38. 5	76. 9	61. 5	103. 8
November	53	49	9. 4	0	45. 3	32. 6 24. 5	45. 3	42. 9	101. 7
December	53	45	39. 6	15. 6	58. 5	51. 1 22. 2	1. 9	11. 1	118. 5
Total	417	391	16. 3	13. 3	48. 4	29. 9 23. 0	35. 3	33. 8	------

[1] See footnote 1, table 6. Of the 2 figures given in this column for each month, the upper is for grade 2; the lower for grade 3.

sity of fur in mature animals does not occur in young animals not yet having completed their first molt.

EFFECT OF SEX ON GRADE OF SKINS

During the latter part of this experiment the bucks were castrated. The relationship of the grades of skins from the castrated and uncastrated bucks and the does is shown in table 9. A slightly higher percentage of the raw skins from the uncastrated bucks graded as No. 1 than from the does or the castrated bucks. A slightly lower percentage of doe skins graded No. 3 than of buck skins, and there was a slightly higher percentage of No. 3 skins from the castrated bucks than from the uncastrated bucks. The uncastrated bucks were, on the average, about 1 week older when 6 pounds in weight than the other rabbits. As is shown also in table 5, sex is of minor consequence as a factor affecting grades of raw skins from 6-pound rabbits.

After the skins were sheared and dyed, only 6.5 percent of the castrated-buck skins graded No. 1, whereas 38.0 percent graded as rejects.

TABLE 8.—*Relation between month in which skins were taken and grade of skins from 3 weight groups of 6-pound rabbits*

101-Day-Old Rabbits

Month	Raw skins			Sheared and dyed skins			
	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3	Rejects
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
January	0	1	3	0	1	0	3
February	2	0	0	0	0	0	1
March	1	0	0	1	0	0	0
April	0	1	1	0	0	1	1
May	0	1	2	0	1	1	0
June	0	1	1	0	1	1	0
July	0	3	4	2	3	1	1
August	1	3	4	1	2	1	4
September	0	1	2	0	0	1	2
October	0	0	1	0	0	0	1
November	1	2	3	0	1	2	1
December	0	0	0	0	0	0	0
Total	5	13	21	4	9	8	14
Percent	12. 8	33. 3	53. 9	11. 4	25. 8	22. 8	40. 0
108-Day-Old Rabbits							
January	0	0	0	0	0	0	0
February	0	3	1	0	0	1	3
March	0	0	0	0	0	0	0
April	0	2	0	0	2	0	0
May	0	1	0	0	0	0	1
June	0	1	2	1	0	1	1
July	0	2	1	1	2	0	0
August	3	2	2	1	1	3	2
September	0	3	1	0	0	1	3
October	0	0	0	0	0	0	0
November	1	2	2	0	2	1	2
December	2	2	0	1	3	0	0
Total	6	18	9	4	10	7	12
Percent	18. 2	54. 5	27. 3	12. 1	30. 3	21. 2	36. 4
115-Day-Old Rabbits							
January	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0
April	0	1	0	0	1	0	0
May	2	5	3	2	1	3	3
June	0	0	0	0	0	0	0
July	2	4	2	1	2	3	2
August	0	1	1	1	0	0	1
September	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0
November	0	0	0	0	0	0	0
December	5	6	0	1	3	3	0
Total	9	17	6	5	7	9	6
Percent	28. 1	53. 1	18. 8	18. 5	26. 0	33. 3	22. 2

In the doe skins, the percentage distribution was about the same in the processed and raw skins though a given skin was not necessarily graded the same in the processed and raw states.

TABLE 9.—*Relation between sex of 6-pound rabbits and grade of their skins*

RAW SKINS

Grade of skins	Castrated bucks			Uncastrated bucks			Does		
	Total animals	Percentage in designated grade	Average age	Total animals	Percentage in designated grade	Average age	Total animals	Percentage in designated grade	Average age
	Number	*Percent*	*Days*	*Number*	*Percent*	*Days*	*Number*	*Percent*	*Days*
1	16	15. 0	110. 4	17	18. 5	124. 9	35	16. 0	115. 6
2	48	44. 8	107. 8	42	45. 6	113. 8	112	51. 4	110. 2
3	43	40. 2	98. 4	33	35. 9	105. 0	71	32. 6	103. 7
Total	107	100. 0	104. 4	92	100. 0	115. 4	218	100. 0	107. 3
SHEARED AND DYED SKINS									
1	6	6. 5	102. 5	10	11. 0	137. 5	36	17. 3	103. 2
2	27	29. 4	102. 6	29	31. 8	108. 1	61	29. 3	110. 5
3	24	26. 1	105. 4	28	30. 8	112. 7	38	18. 3	107. 3
Reject	35	38. 0	107. 3	24	26. 4	118. 2	73	35. 1	106. 5
Total	92	100. 0	105. 1	91	100. 0	115. 4	208	100. 0	107. 2

RELATION BETWEEN GRADES OF CARCASS AND SKIN

The question arose as to whether No. 1 raw skins and Prime carcasses can be produced in the same animal. Information on this point is given in table 10, which shows the relation between carcass and skin

TABLE 10.—*Relations between grades of carcass and grades of raw skin in 409 animals*

Grade of carcass	Total skins	Skins in grade—		
		1	2	3
	Number	*Percent*	*Percent*	*Percent*
Prime	161	16. 1	50. 4	33. 5
Choice	225	16. 9	44. 9	38. 2
Commercial	23	0	78. 3	21. 7

Grade of skin	Total skins	Skins from carcasses grading—		
		Prime	Choice	Commercial
	Number	*Percent*	*Percent*	*Percent*
1	64	40. 6	59. 4	0
2	200	40. 5	50. 5	9. 0
3	145	37. 2	59. 3	3. 5

grades of rabbits raised to 6 pounds of weight. Approximately as high a percentage of the animals with Prime carcasses had No. 1 skins as did those with only Choice carcasses. None of the few animals with the Commercial carcasses had any No. 1 skins. About 40 percent of the animals producing each grade of skin had Prime carcasses and approximately 50 to 59 percent had Choice carcasses. The conclusion drawn from the data is that No. 1 skins can be successfully produced on animals yielding the highest quality carcasses.

SKINS FROM RABBITS OF VARYING WEIGHTS

A total of 216 skins was taken at the United States Rabbit Experiment Station from self-fed animals ranging in weight from 4 to 12 pounds. The numbers of does, uncastrated bucks, and castrated bucks were comparable, and the animals were slaughtered when they attained the desired weights in integral pounds. Naturally the ages at any desired weight varied considerably.

As shown in table 11, when the skins are grouped regardless of sex, the grades of the skins from the 5- and 6-pound rabbits (average age 71 and 91 days) were slightly better than those of the rabbits weighing 7 to 9 pounds inclusive (average age 98 to 134 days). The general trend was the same for the skins from each of the sexes. The best raw skins, on the average, were from the 5-pound rabbits and the next best were from the 10- and 11-pound rabbits, but the weighted grades of these were lower than 2.27, which definitely shows that factors other than weight of rabbit affect the quality of skin produced. When judged in the dressed condition, the skins from the 10- to 12-pound animals were superior, on the average, to the others except for the 6-pound group. The average grades of the skins from all the does, uncastrated bucks, and castrated bucks show practically no difference.

The average grades of the 216 skins are tabulated in table 12 by 5-day intervals in the age of the rabbits. The skins from rabbits to 70 days old were poorer than those from rabbits 70 to 105 days old, but the poorest grades of skins came from rabbits 105 to 135 days old. These findings agree with those for the 6-pound rabbits of varying ages (table 6). The general trend was for the quality of skin to improve slightly with advancing age. The question arises as to whether the cost of producing these older rabbits can be recovered in the additional prices to be received for the better quality skins and the additional meat.

The effect of season on the quality of the 216 skins from rabbits varying in weights from 4 to 12 pounds and in ages from 56 to 300 days is shown in table 13. For this purpose the grades of the sheared and dyed skins were used because in the dressing process the skins are cut open and the fur is available for critical examination. In this table the skins were grouped into comparatively large units that had somewhat similar average grades. Except for January, the skins taken during the winter and early spring months were of slightly better quality than those taken during other periods of the year. The poorest skins were taken in August and September.

TABLE 11.—*Weighted average grades* [1] *of raw and dressed skins from 216 rabbits 4 to 12 pounds in live weight*

Live weight of rabbits (pounds)	Does			Uncastrated bucks			Castrated bucks			Total rabbits			Weighted average grades of skins							
	Total animals	Age of animals		Total animals	Age of animals		Total animals	Age of animals		Total animals	Age of animals		Does		Uncastrated bucks		Castrated bucks		All skins	
		Range	Average		Range	Average		Range	Average		Range	Average	Raw	Dressed	Raw	Dressed	Raw	Dressed	Raw	Dressed
	Number	*Days*	*Days*	*Number*	*Days*	*Days*	*Number*	*Days*	*Days*	*Number*	*Days*	*Days*								
4	8	------	56	8	------	56	------	------	------	16	------	56	2.88	2.75	2.62	3.00	------	------	2.75	2.88
5	14	69–83	72.1	8	60–79	66.2	8	71–77	74.1	30	60–83	71.1	2.07	2.78	2.88	2.88	2.00	1.88	2.27	2.57
6	8	80–96	89.9	8	80–107	95.5	8	71–99	86.4	24	71–107	90.6	3.50	2.88	1.75	2.00	2.25	2.25	2.50	2.38
7	8	85–109	95.8	8	83–118	101.4	8	87–109	98.0	24	83–118	98.4	2.75	3.00	2.38	2.25	2.75	2.75	2.62	2.67
8	8	94–147	110.6	9	98–185	133.6	8	110–134	119.1	25	94–185	121.6	3.00	3.12	3.22	3.11	3.00	3.00	3.08	3.08
9	9	104–185	126.0	13	128–213	151.8	6	112–157	129.3	28	104–213	134.0	2.44	2.67	3.00	2.54	3.00	2.66	2.82	2.61
10	17	123–185	155.8	11	117–300	180.0	8	142–190	162.8	36	117–300	169.5	2.24	1.76	2.64	2.36	2.62	2.50	2.44	2.11
11	8	138–231	178.1	8	136–250	190.5	7	164–223	195.6	23	136–250	187.7	2.50	1.88	2.50	2.75	2.28	2.71	2.43	2.39
12	4	165–278	220.7	------	------	------	6	173–223	214.3	10	165–278	216.9	2.25	2.00	------	------	3.00	2.33	2.70	2.20
Total or average	84	------	------	73	------	------	59	------	------	216	------	------	2.62	2.54	2.62	2.61	2.62	2.57	2.63	2.57

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[1] Obtained as stated in footnote 1 of table 1.

Table 12.—*Weighted average grades*[1] *of raw and of dressed skins from 216 rabbits varying in age from 56 to 300 days*

Age of rabbits in days	Weighted average grade of skins		Age of rabbits in days	Weighted average grade of skins		Age of rabbits in days	Weighted average grade of skins		Age of rabbits in days	Weighted average grade of skins	
	Raw	Dressed		Raw	Dressed		Raw	Dressed		Raw	Dressed
56–59	2. 75	2. 87	105–109	2. 72	2. 92	155–159	2. 21	2. 08	210–214	2. 00	2. 11
60–64	3. 05	3. 09	110–114	2. 95	2. 90	160–164	2. 42	2. 08	215–219	2. 33	2. 51
65–69	2. 82	2. 87	115–119	2. 87	2. 79	165–169	2. 52	2. 04	220–224	2. 33	2. 29
70–74	2. 48	2. 61	120–124	3. 09	2. 64	170–174	2. 72	2. 37	230–234	2. 00	2. 00
75–79	2. 23	2. 48	125–129	2. 97	2. 58	175–179	2. 39	2. 04	250–254	2. 00	3. 00
80–84	2. 45	2. 43	130–134	3. 01	2. 65	180–184	2. 50	2. 40	260–264	2. 00	2. 00
85–89	2. 65	2. 49	135–139	2. 62	2. 49	185–189	2. 50	2. 07	275–279	1. 00	1. 00
90–94	2. 70	2. 65	140–144	2. 62	2. 51	190–194	2. 72	2. 62	300–304	2. 00	1. 00
95–99	2. 52	2. 66	145–149	2. 46	2. 28	195–199	2. 39	2. 11			
100–104	2. 52	2. 67	150–154	2. 42	2. 19	205–209	2. 22	2. 34			

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[1] Obtained as stated in footnote 1 of table 1.

TABLE 13.—*Relation of age of rabbits and season when skins were taken to weighted average grades*[1] *of dressed skins*

Age of rabbits in days	Grades of skin	Skins taken in—												Total	Weighted average grade of skins
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		
		Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*		
56–69	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3. 00
	2	0	0	0	0	2	1	0	3	1	1	0	0	8	
	3	0	0	0	0	3	0	3	0	1	0	0	0	7	
	4	0	0	0	0	3	2	3	0	0	0	0	0	8	
70–89	1	0	0	0	1	0	2	1	0	0	0	0	0	4	2. 32
	2	0	2	0	6	1	7	4	0	0	0	0	0	20	
	3	0	2	0	2	0	3	2	0	1	0	0	0	10	
	4	0	0	0	0	0	0	0	1	2	0	0	0	3	
90–139	1	0	0	0	2	0	0	0	0	0	0	1	1	4	2. 74
	2	2	0	5	4	3	4	2	0	0	3	4	3	30	
	3	1	1	3	2	4	5	4	1	0	0	8	2	31	
	4	2	0	1	1	0	3	6	2	0	1	1	0	17	
140–209	1	1	2	5	1	1	0	0	0	0	0	0	0	10	2. 24
	2	4	2	6	2	4	2	2	0	0	0	1	1	24	
	3	4	0	4	2	3	4	2	2	0	0	0	1	22	
	4	0	0	0	0	0	1	0	0	0	0	0	0	1	
210–259	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2. 64
	2	0	1	4	0	0	1	0	0	0	0	0	0	6	
	3	0	0	2	1	0	1	1	0	2	0	0	0	7	
	4	0	0	1	0	0	0	0	0	0	0	0	0	1	
260–304	1	0	0	0	0	1	0	0	0	0	0	1	0	2	1. 33
	2	0	0	0	1	0	0	0	0	0	0	0	0	1	
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	
	4	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	-----	14	9	32	24	26	36	30	9	7	5	16	8	216	-----
Weighted average grade of skins		2. 57	2. 22	2. 22	2. 21	2. 54	2. 47	2. 64	3. 00	3. 14	2. 40	2. 50	2. 25	-----	2. 54

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[1] Obtained as stated in footnote 1 of table 1.

WOOLLY CARRIER IN RABBITS

Woolliness crops out in many rabbitries. Inheritance of woolliness is due to a unit recessive factor that is suppressed by the dominant factor for normal short hair until by certain matings the recessive is eliminated. If the woolly factor is inherited from both parents, the animal appears as a woolly individual and such an animal breeds true for this characteristic. The fine, long-haired condition of the Angora rabbit is dependent upon these same factors, but through the influence of certain additional modifying factors its appearance has been accentuated and has become of practical economic value. Angoras are frequently used to test the presence of the recessive character of woolliness in a herd of normal-coated rabbits. In fact, it is believed that Angoras were crossed with normal-haired rabbits some years ago to soften the fur and thereby make a supposedly more desirable pelt.

Because of the prevalence of this recessive woolly character in the New Zealand White breed, a study was made of fryer rabbitskins and mature skins taken from rabbits known to carry this woolly factor, yet appearing normal; from animals absolutely free from this character; and also from individuals appearing woolly. The woolly skins were judged to be worthless in the fur trade as well as in the hat trade. There was not a sufficient number of skins included in this study to permit definite conclusions, but indications were that skins, of the quality used in this study, from woolly carriers were graded about the same as skins from animals known to be genetically free from woolliness.

SUMMARY AND CONCLUSIONS

More than 1,000 skins were taken from New Zealand White rabbits at the United States Rabbit Experiment Station, Fontana, Calif., and the University of Minnesota to determine the effect, on grades of domestic rabbitskins, of various factors, including age and sex of the rabbits, methods of feeding, climate, and season of the year when the skins were taken. These rabbits varied in age from 56 days to more than 12 months. The skins were individually marked and were graded in the raw state, as well as after shearing and dyeing, by experts in the trade. The following results were obtained.

Restricted grain feeding of fryer rabbits (56 to 76 days of age) tended to produce a higher percentage of No. 1 pelts than did self-feeding of rabbits of comparable age. This difference apparently was due to the fact that restricted grain feeding results in slow growth. The animals had not yet developed to the stage at which shedding of the fur had begun.

Skins from self-fed fryer rabbits produced in Minnesota graded no higher than those in California, indicating that climate has little or no effect on the quality of such skins. Furthermore, live weight of 56- to 61-day-old rabbits, as well as season of the year when the skins were taken, had no consistent relationship to the quality of pelts produced. In the fryer rabbits, however, as well as in 85-day-old rabbits, skins from the does graded lower than those from the bucks. The yield of hatter's fur from fryer skins was materially influenced by grade of skin and sex.

In 6-pound rabbits, the older, slower developing ones produced materially better skins than the younger rabbits. However, season when skins were taken, sex of the animals, and grade of carcass had little effect on the skin grade.

In self-fed rabbits weighing 4 to 12 pounds, the poorest skins came from the 7- to 9-pound animals, ranging from 98 to 134 days old. The older animals, on the whole, produced the best skins. Slightly the best skins were produced in the colder months and the poorest skins were taken in August and September. Sex apparently had little effect on skin quality.

These studies show, therefore, that of the various factors studied, age and, consequently, live weight had the greatest effect on grade of skins. Because most domestic rabbits are marketed in the United States when about 2 months old, primarily for their meat, the skins are small and the fur is of poorer quality than that of older rabbits.

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